

DETERMINANTS OF FAILURE IN GREEK MANUFACTURING SMES

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Abstract

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The globalization and the global financial crisis provide a new extremely competitive environment for small and medium sized enterprises (SMEs). During the latest years, the increased number of firms' default has generated the need of understanding the factors of firms' default, as SMEs in periods of financial crisis suffer from lack of financial resources and expensive bank lending. We use a sample of 3600 Greek manufacturing firms (9 Sectors), covering the time period of 2003-2011 (9 years). We run a panel regression model with correction for fixed effects in both the cross-section and period dimensions using as dependent variable the calculated Z-Score of each firm, and as independent variables several financial ratios, as well as the exporting activity and the use of International Financial Reporting Standards (IFRS Accounting Standards). We find that firms presenting higher performance in terms of ROA and sales and higher leverage levels that enhance their liquidity as well are healthier in terms of Z-score than their less profitable counterparts and acquire lower rates of probability of default: in other words, less risk. The results of the study can lead to policy implications for both Managers and the Government in order to enhance the growth of Greek manufacturing sector.

Keywords: Default, Survival, SMES, Manufacturing, Greece, Z-Score, Risk

1. INTRODUCTION

The globalization and the increasing competition especially during the latest years of crisis have caused an increased number of firms' defaults. Considering the fundamental role played by small and medium enterprises (SMEs) in a country's economic growth (Altman and Sabato, 2007) and that are more vulnerable to period of economic turbulence (Jahur and Quadir, 2012; Latham, 2009), determinants of credit risk and its management gained significant attention among academics, practitioners and professionals. Default risk is defined as a function of firm's capacity to generate cash flows from its operations and financial obligations including interests and principle payments (Damodaran, 2010), while risk management has significant implications for business enabling the development of a strategy to reduce potential losses and exploiting new opportunities (Radner and Shepp, 1996; Garefalakis et al., 2016; Garefalakis et al., 2011).

Failure factors are often neglected and in any case, they need to be explored out and thoroughly addressed (Benzing et al., 2009). They also found out that unstable political and economic environment, as well as other factors related to complicated and difficult firms' taxation, law inconsistencies are

common issues faced by the developing countries. According to Hussain et al. (2010) lack of financial assistance and inability to access financial resources tend to become the most influential failure factors. Results of other studies on core factors of Manufacturing firms reveal that customer service is considered to be the most important factor (Yaquub et al., 2010). They also find that entrepreneur's experience and the well know-how of the business sector are also important drivers of success.

The objective of this study is to apply Altman's Z-score ratio as measure of financial distress in an empirical analysis focused on Greek manufacturing SMEs and investigate the Risk level of manufacturing firms in relation with their financial ratios.

Why Greece?

Greek manufacture has suffered an unprecedented decrease of its growth, caused by a 30% fall of GDP and urgently needs policies that will help restart its economic activity and reduce its unemployment rate. Greek GDP has shrunk by almost 30% since 2007, i.e. before the beginning of the crisis. Greece has suffered from deindustrialization as a result of manufacturing decline (Pitelis & Antonakis, 2003), while growth of manufacturing is regarded as a vital element in the sustainability of economic recovery; hence Greece is a hot topic these days.

Although SMEs are the backbone of the country's economy, the bulk of empirical research on risk default is focused on financial institutions (Tan and Floros, 2013; Lemonakis et al. 2016a; Dimitras et al., 2013) and little research on the determinants on default risk at SMEs' level exists, while it is no existent at Greek data. This study contributes to the relevant literature introducing more financial ratios and other variables such as exporting activity and International Financial Reporting Standards (IFRS) in examining determinants of SMEs' financial distress.

The structure of the paper is the following. In second section the relevant literature on this subject is presented. In the third section the methodology, data and results of this research are discussed. The final section of this work presents the concluding remarks and further research about this subject.

2. LITERATURE REVIEW

Most of the studies referred at SMEs have been made on the constraints of profitability, growth, exports and technological capacity (Lemonakis, 2016b). SMEs in economic crisis may suffer disproportionately from economic downturns, because of their limited financial resources and dependence on banks' lending, paying such high interest rates (Bourletidis & Triantafyllopoulos, 2014). Survival and success is dependent on the strategic decision-making and positioning for competitiveness. Strategies that seem to increase competitiveness are the development of firms with a high Z-Score that represents the financial health of the firm.

Empirical studies made on probability of default for enterprises, based on Multiple Discriminant Analysis (MDA) and Logistic Regression Analysis (logit) approaches based primarily on financial ratios such as profitability, cash flow and leverage ratios can be used as business default predictor variables. Altman's Z-score is one of the best statistically derived predictive models used to forecast a firm's probability bankruptcy (Moyer, 2005), thus Z-Score variable is used to our work to formulate the Level of Financial Strength of Greek Firms in terms of default risk.

Altman (1968) used MDA in order to predict the financial default of a business failure. From a set of twenty-two financial ratios, he finally selected five that gave in combination the best overall prediction of business default. Altman & Sabato (2007), develop a distress prediction model specifically for the SME sector and to analyze its effectiveness. They use a logit regression technique on panel data of over 2,000 U.S. firms (with sales less than \$65 million) over the period 1994-2002, and they develop a one-year default prediction model. They use core financial ratios, such as working capital/total assets, retained earnings/total assets, EBIT/total assets, and book value equity/total assets, to find the Z-score in order to predict SMEs default.

Little research about the determinants of default in micro-level exists. Pachedo (2015) examined the determinants of firms' default probability using logit methodology in data of SMEs from hospitality sector in Portugal. Debt and equity variables are found to be correlated with firm failure, while over-reliance on the profitability as a good economic performance indicator should be

restricted. Fidrmuc and Hainz (2010) in their empirical study using several probit and panel probit models show that liquidity and profitability factors are significant determinants of SMEs' defaults in Slovakia. McCann & McIndoe-Calder (2012) examined the determinants of default at micro-level for 6000 Irish SMEs indicating that typical financial ratios such as loan to total assets, current ratio, leverage ratio, liquidity and profitability ratio are significant predictors for firm default.

Pompe and Bilderbeek (2005) examined several aspects of bankruptcy prediction in Belgian SMEs aiming to test the predictive power of different ratio categories during successive phases before bankruptcy and the correlation with firm's age and probability of default. Using profitability, liquidity, activity and solvency ratios in their empirical study and found that every ratio has some predictive power, while measuring probability of default in younger firms is more difficult than older, while the older the firm, the smaller the probability of default is (Altman, 1993).

Firm size also seems to be significant variable in measuring default risk of a firm. According to Ohlson (1980), there is evidence indicating that the size of a firm has a significant impact on its credit risk exposure. Small-sized firms present higher probability of default against medium and large-sized that are more diversified and less vulnerable to sector-specific crises.

This is the first study introducing variables of IFRS and exporting activity as determinants of firm's probability default. There is evidence through empirical studies indicating that SMEs with exporting activity are better able to adapt to a financial crisis (Ter Wegner and Rodriguez, 2006). Arslan and Karan (2009) examining determinants of credit risk for 1.166 Turkish SMEs data set derived into exporting and non-exporting. It is found that SMEs with exporting activity the probability of default increased with the ratio of inventories to total assets, but decreased with net profits and net sales. However, the likelihood of firm default for SMEs with non-exporting activity (only domestic market) presented to have a strong positive correlation with trade credits, corporate tax, financial expenses and net profit margin, while it is negative for gross profit margin.

3. METHODOLOGY AND APPROACH

We attempted to identify the critical factors which affect firm risk default of the firms for each industry sector. This is used to derive policy implications for firm managers; this also could help firms increase their competitiveness and growth. We run a panel regression model using as dependent variable the calculated Z-Score of each firm, and as independent variables the financial data (X's variables). The research is based on balanced financial data of 3600 Greek manufacturing firms (9 Sectors), covering the time period of 2003-2011 (9 years).

For the Z-Score (firm risk factor) we used the Altman's (1968) bankruptcy model that is given by the formula:

$$Z' = 0.717X_1 + 0.847X_2 + 3.107X_3 + 0.420X_4 + 0.998X_5 \quad (1)$$

where:

X1= (Current Assets-Current Liabilities)/ Total Assets;

X2=Retained Earnings/Total Assets;

X3=Earnings before Interest and Taxes/Total Assets;

X4=Book Value of Equity/Total Liabilities;

X5=Sales/Total Assets.

The higher the value of Z-score, the smaller the probability of firm's default. According to Altman, companies that have Z-score above 3.00 are considered healthy, while those with less than 1.80 are confronted with significant chances of probability of bankruptcy (i.e.: 80-90%) in the next two years. Companies with this criterion within the range of 1.81 and 2.70 have a good chance in the next two years from the publication of the balance sheet to be in financial difficulty. Finally, companies whose index Z ranging from 2.71 to 2.99 should take steps to avoid future financial problems.

3.1. Data Description

The Financial data (ratios) were derived from the financial statements of the sample firms from the data base of ICAP Hellas, a private Data base company.

Based on previous literature (Altman and Sabato, 2007; Pompe and Bilderbeek (2005); this research attempts to provide new evidence using data for:

X1: AGE=2011-YEAR OF ESTABLISHMENT;

X2: EXPORTS (Firms' exporting activity, 1=for "Yes" and 0=for "No");

X3: IFRS (International Financial Reporting Standards in Accounting);

X4: ROA (Return on Assets ratio);

X5: Leverage=Total debt/Total Assets;

X6: TOTAL SALES/TOTAL ASSETS;

X7: ACID LIQUIDITY RATIO ((WORKING CAPITAL-INVENTORIES)/SHORT TERM DEBT);

X8: INTEREST EXPENSES/TOTAL SALES;

X9: (ACCOUNTS PAYBLE/COST OF GOODS SOLD)*360.

Based on theory and literature, we choose to run the following panel equation using Least squares (we regress Z-score against X's variables). We also estimate panel equation with correction for fixed effects in both the cross-section and period dimensions, AR errors, GLS weighting, and robust standard errors.

The equation has the following form:

$$Z = \alpha + \beta_1 X_1 + \dots + \beta_9 X_9 + \epsilon_i \quad (2)$$

4. REGRESSION RESULTS

In a new extremely competitive environment for firms, SMEs especially experience high pressure during to lack of liquidity, outdated technology, labour intensive and practices. In that context, SMEs struggling to survive, sustain their competitiveness and develop.

Our results suggest that the independent variable with positive and significant effect on Z-Score are profitability in terms of ROA, leverage ratio and total sales to total assets (proxy for Firms' Growth), while the variables with negative impact are age and IFRS.

Table1. Results

Variable	Coefficient	t-statistic	Prob
c	1.435	37.586	0.000 (**)
X1	-0.002	-1.985	0.047 (*)
X2	-0.027	-0.810	0.417
X3	-0.336	-4.896	0.000 (**)
X4	1.245	9.487	0.000 (**)
X5	0.233	25.651	0.000 (**)
X6	0.049	4.149	0.000 (**)
X7	0.0001	0.790	0.429
X8	-0.00053	-0.485	0.627
X9	-5.64E-10	-0.240	0.810

Note: $R^2=3.27$; Prob. (F-Statistic)=0.000; **significance at 1% level and (*) significance at 5%

Age is an obvious control variable which is negatively related with the probability of distress event. The fact that the age of the firm has a negative effect to the firms' long-term financial viability happens because older firms may not be able to change their operation as quickly as their younger counterparts do after entering in a distress event. Also, younger firms are more likely to change their methods, their financial decisions and their targets in order to avoid the possibility of distress event. For older firms, practice has shown that they are slowly movers to potential changes in traditional methods used for years. Plus, it is difficult for the management team to reverse the shareholders demands and to change productivity methods or even their scope according to new investment plans.

Efficiency is positively related to the possibility of financial distress events. Many researchers agree that efficiency and growth rate are positive characteristics for business. It minimizes financial distress because productive firms always remain viable and effective enough as well. It can also deteriorate crises such as decline of market share and loss of talented personnel or even the default rate.

Table2. Period fixed effects

	Year	Effect
1	2003	0.193397
2	2004	0.214717
3	2005	0.001116
4	2006	0.053655
5	2007	0.027732
6	2008	0.024129
7	2009	-0.121400
8	2010	-0.195705
9	2011	-0.197641

Furthermore, the management team is well aware of the fact that rapid growth demands additional assets in the form of equipment and property plants, inventories and account receivable which require capital for additional assets purchase for the excess growth. This is why appropriate levels of Leverage are becoming an important asset for firms' viable growth. Alternatively, in case that a firm's management team seeks to define which kind of strategic decisions may be taken in order to find appropriate funding for its growth, one should compare the actual growth rate to its sustainable growth rate.

In general, firms presenting higher performance in terms of ROA and sales and higher leverage levels that enhance their liquidity as well are healthier in terms of Z-score than their less profitable counterparts and acquire lower rates of probability of default: in other words, less risk.

5. POLICY IMPLICATIONS – FURTHER RESEARCH

Manufacturing are the backbone of any economy worldwide. This study aims to identify certain factors critical to the success and failure of the Manufacturing firms in Greece. Due to high failure of firms in Greece, especially during the crisis period, this study tries to address the reasoning factors and to explore different failure factors, thus can be helpful for many firms, to identify the real cause of default and how to avoid this event. The recent economic crisis (2008) influenced the effectiveness of companies especially from the years 2010 and 2011. However, the most effective one for the all manufacturing firms under examination period, was that of 2003, i.e. a year before the Athens Olympic Games. Moreover, from 2004 onwards, a steady decline in efficiency for all Greek enterprises takes a stable tendency. Empirical investigation of the failures of Greek companies is to be analyzed with more data, examining how different factors such as the size of companies and the number of employees, can affect both efficiency and default levels, especially in Manufacturing firms.

Since Greek economy is under a severe economic crisis, the study can help management to identify aspects that could help overcome the crisis. The findings of this study are valuable presenting implications for practitioners, managers and policy makers. The results of the study can lead to policy implications for both Managers and the Government in order to facilitate the reduction of the number of SMEs default and enhance the growth of Greek manufacturing sector. This is especially important now in Greece and can contribute to the start-up of the Greek economy. Further research can be done examining similar topic using data from European firms and comparing our results. In addition, qualitative factors that determine risk default of SMEs can be examined too.

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APPENDIX

Panel A. Covariance Analysis

Covariance Analysis: Ordinary
 Date: 12/19/15 Time: 17:22
 Sample: 2003 2011
 Included observations: 32400

Covariance Correlation	X1	X2	X3	X4	X5	X6	X7	X8	X9	ZSCORE
X1	256.7672 1.000000									
X2	0.947074 0.122494	0.232810 1.000000								
X3	0.389619 0.101246	0.008625 0.074435	0.057674 1.000000							
X4	0.027287 0.012030	0.001568 0.022963	-0.001825 -0.053688	0.020036 1.000000						
X5	-1.461022 -0.048917	-0.031189 -0.034679	-0.008451 -0.018880	0.003835 0.014537	3.474145 1.000000					
X6	-0.462756 -0.018473	-0.004281 -0.005676	-0.005448 -0.014512	0.096685 0.436931	0.701130 0.240623	2.443854 1.000000				
X7	-14.57122 -0.010362	-0.305405 -0.007213	-0.087383 -0.004146	1.355077 0.109089	8.149009 0.049820	0.405160 0.002953	7701.044 1.000000			
X8	0.473264 0.001984	-0.078637 -0.010947	0.022825 0.006384	-0.012099 -0.005741	0.068479 0.002468	-0.134923 -0.005797	-0.207013 -0.000158	221.6525 1.000000		
X9	1227241. 0.011030	-35737.44 -0.010667	3851.736 0.002310	1672.601 0.001702	-39348.85 -0.003040	-68214.12 -0.006284	1077055. 0.001768	27494.26 0.000266	4.82E+13 1.000000	
ZSCORE	-1.015555 -0.021250	-0.016799 -0.011674	-0.027265 -0.038066	0.032746 0.077566	0.857439 0.154242	0.411148 0.088183	4.645987 0.017751	-0.133377 -0.003004	-40220.38 -0.001942	8.895127 1.000000

Panel B. Cointegration Test

Pedroni Residual Cointegration Test

Series: X4 X5 X6 X7 X8 X9 ZSCORE
 Date: 12/19/15 Time: 17:29
 Sample: 2003 2011
 Included observations: 32400
 Cross-sections included: 3600 in non-parametric (PP) test; 0 (3600 dropped) parametric (ADF) test
 Null Hypothesis: No cointegration
 Trend assumption: No deterministic intercept or trend
 Lag selection: fixed at 1
 Newey-West bandwidth selection with Bartlett kernel

Alternative hypothesis: common AR coefs. (within-dimension)

	Statistic	Prob.	Weighted Statistic	Prob.
Panel PP-Statistic	-25.76613	0.0000	-6.935458	0.0000

Alternative hypothesis: individual AR coefs. (between-dimension)

	Statistic	Prob.
Group PP-Statistic	-125.4794	0.0000

We reject the null hypothesis of no cointegration at 5% level. There is evidence of long-run relationship between the variables.

Panel C. Granger Causality

Pairwise Granger Causality Tests

Date: 12/19/15 Time: 17:34

Sample: 2003 2011

Lags: 1

Null Hypothesis:	Obs	F-Statistic	Prob.
ZSCORE does not Granger Cause X4 X4 does not Granger Cause ZSCORE	28800	40.4593 5787.72	2.E-10* 0.0000*
ZSCORE does not Granger Cause X5 X5 does not Granger Cause ZSCORE	28800	89.3290 1887.31	4.E-21* 0.0000*
ZSCORE does not Granger Cause X6 X6 does not Granger Cause ZSCORE	28800	125.311 24413.7	5.E-29* 0.0000*
ZSCORE does not Granger Cause X7 X7 does not Granger Cause ZSCORE	28800	0.44243 337.004	0.5060 8.E-75*
ZSCORE does not Granger Cause X8 X8 does not Granger Cause ZSCORE	28800	0.07249 0.23607	0.7877 0.6271
ZSCORE does not Granger Cause X9 X9 does not Granger Cause ZSCORE	28800	0.13728 0.13517	0.7110 0.7131

* Reject the Hypothesis (short-run causal relationship).

Bi-directional Granger causality: Z-Score & X4 (ROA), Z-Score & X5 (Leverage), Z-Score & X6 (Total Sales/Total Assets)

Uni-directional Granger causality: X7 (Acid Liquidity Ratio)→ Z-Score.